



NASA Langley's Engineering Code for Designing Radiation Shielding

High-charge-and-energy transport computer software to obtain fast and accurate dosimetric information for designing devices

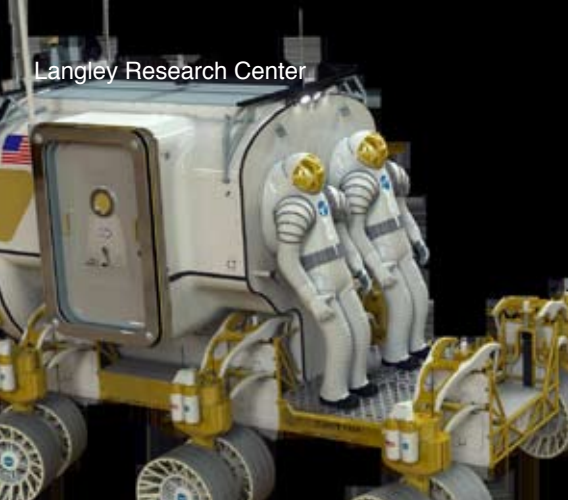
NASA protects its astronauts and equipment from radiation exposure. For 25 years, NASA has used the high-charge-and-energy transport computer software (HZETRN) code to estimate the radiation flux and the potential exposure levels, and to design effective protective shielding from damaging radiation. The most recent version of the code is a high-fidelity model that is built upon years of NASA experience and that has benefited from the incorporation of tweaks and corrections to the code based on radiation tests and mission data. NASA uses the code to select materials and designs for radiation shields in support of its missions to the moon and Mars, and is seeking partners to license the code for commercial use.

Benefits

- Reduced radiation damage due to continuous exposure
- Weight savings: Allows selection of lightest effective material
- Maximized cost/performance of shield design: Identifies radiation constraints early in the process
- Benchmark for code validation: Reliable, repeatable, and high-fidelity model can serve as standard
- Accurate flux and dose equivalents
- Numerical stability: Mature code
- Highly efficient computation tools to handle design uncertainties
- Platform and operating system independent

partnership opportunity





Applications

The HZETRN software can be used to analyze radiation loads and evaluate radiation shielding at all stages of the development process, from conceptual studies to high-fidelity final designs. The following industries are relevant:

- Space systems: for designing radiation shielding for space missions for NASA and the commercial space industry
- Aircraft: to protect sensitive equipment from radiation damage
- Reactors: for designing shielding for nuclear reactors
- Medical: for use in designing shielding for radiation therapy

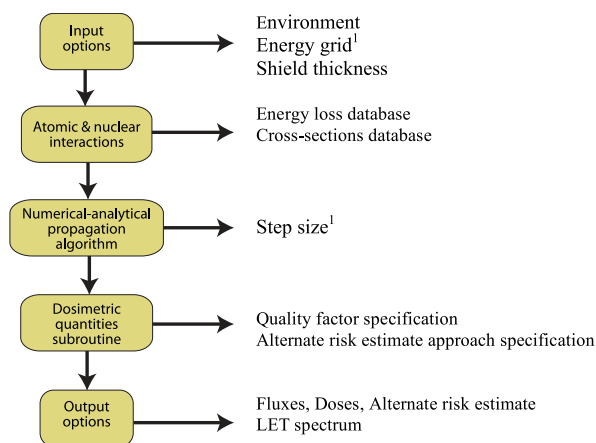
The Technology

HZETRN is a free-space ion and nucleon transport and shielding computer program. Improved spacecraft shield design processes require early consideration of radiation constraints to maximize performance while minimizing costs. HZETRN models radiation for use in all design stages from preliminary concepts to final designs with a high degree of computational efficiency. It is intended specifically for the design engineer who is interested in obtaining fast and accurate dosimetric information for designing devices in which radiation exposure is a concern.

The HZETRN program is essentially platform and operating system independent. As shown in Figure 1, the main program accommodates various input options.

The program calculates the transport/flux of ions based on a deterministic solution to coupled Boltzmann equations derived on the basis of conservation principles and using Monte Carlo simulation techniques. The program accounts for the effects of:

- Long-range Coulomb force and electron interaction
- Atomic stopping power coefficients with energies about a few MeV
- Nuclear absorption cross sections
- Nuclear fragmentation cross sections
- The short time scale of atomic and nuclear processes



¹ Designates semi flexible inputs

Computational Structure of 2005 HZETRN

Figure 1: Chart that shows the structure of HZETRN, including the user inputs to the program

For More Information

If your company is interested in licensing or joint development opportunities associated with this technology, or if you would like additional information on partnering with NASA, please contact:

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